J. HYM. RES.
Vol. 15(2), 2006, pp. 266–269

NOTE

Observations on Flower Association and Mating Behaviour of the Pollen Wasp Species *Celonites abbreviatus* (Villers, 1789) in Greece (Hymenoptera: Vespidae, Masarinae)

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Celonites abbreviatus (Villers) ranges from Morocco across the entire North Mediterranean Area to Turkey. In the North it reaches the southern parts of Central Europe (Gusenleitner 1997). Most information on the bionomics stem from the Central European range of the species (Schremmer 1959, Blüthgen 1961, Bellmann 1984, 1995, Müller 1996, Amiet and Mauss 2003) whereas bionomical records from other parts of its distribution are rare (cf. Lichtenstein 1869, Ferton 1901, Fahringer 1922). Moreover, until now the mating behaviour of the species has been completely unknown.

On a field trip to the Maleas Peninsula of the Peloponnese (Greece, Laconias) *C. abbreviatus* was observed between the 5th and 10th of June 2005 at four localities in the vicinity of Profitis Ilias near Neapoli (I. 36°26.687′ N 23°06.926′ E, 55 m a.s.l.; II. 36°26.719′ N 23° 08.482′ E, 77 m a.s.l.; III. 36°26.122′ N 23°08.303′ E, 10 m a.s.l.; IV. 36°26.252′ N 23°07.012′ E, 20 m a.s.l.). All sites were situated in old, open fallow areas characterised by large patches of *Satureja thymbra* L. (Lamiaceae) with neighbouring *Phrygana* vegetation (Fig. 1) (Ordo Cisto-Micromeretalia Oberdorfer 54; cf. Horvat et al 1974). The ground was hard, stony and only sparsely covered with vegetation. An open source of water was present only in one of the localities.

Females of *C. abbreviatus* were frequently observed to visit flowers of *Satureja thymbra*. During the flower visits the proboscis was protruded into the corolla tube, indicating nectar uptake (Fig. 4). Simultaneously, the facial part of the head was rubbed over the nototribic anthers of the flower, and pollen grains accumulated on the frons of the female (Fig. 4), where modified setae form a pollen-collecting apparatus (Schremmer 1959, Müller 1996). At regular intervals the females interrupted nectar and pollen uptake and transferred pollen from the head to the mouthparts by alternating grooming movements of the forelegs and ingested the pollen (Fig. 5). On two occasions females of *C. abbreviatus* collected pollen from *Thymus capitatus* (L.) Ho. and Li. (Lamiaceae) at localities where

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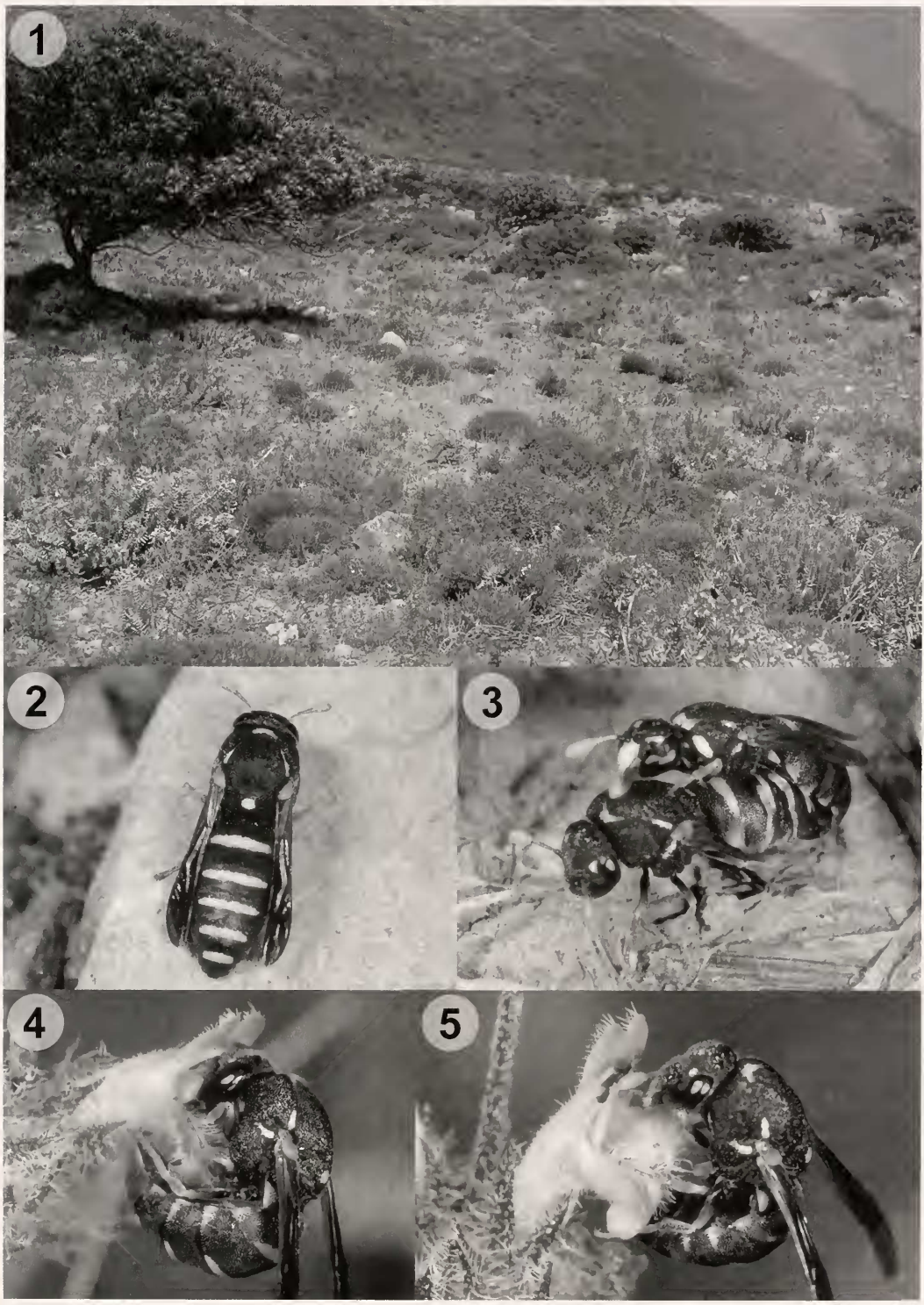
Figs 1–5. Habitat and behaviour of *Celonites abbreviatus* in vicinity of Profitis Ilias (Peloponnese, Greece). 1, Fallow area at locality II with large patches of *Satureja thymbra* (middle and right foreground), at which male and female pollen wasps were observed; *Phrygana* vegetation in background. 2, Female resting on sun-exposed stone. 3, Insertion phase of copulation; male clasping to the back of the female. 4, Female visiting flower of *S. thymbra*; her proboscis is protruded into the corolla tube, and the pollen collecting apparatus on the frons is



rubbed over the nototribic anthers. 5, Female transferring pollen from the fore-tarsal pollen comb of her left foreleg to her mouthparts, after grooming the pollen collecting hairs on the frons with the foreleg.

flowers of *S. thymbra* were nearly or completely withered. During visits to *T. capitatus* females stood with their middle and hindlegs on the lower lip of the flower, raised the anterior part of the body and rubbed the facial area of the head over the nototribic anthers, while the proboscis remained retracted. A single flower visit of a male was recorded at *S. thymbra*. The observed flower visiting behaviour of *C. abbreviatus* on the Maleas Peninsula adds further evidence that *C. abbreviatus* is specialised with regard to its pollen source to flowers of Lamiaceae since in Central Europe, Italy and Croatia pollen collecting of *C. abbreviatus* is also restricted to various flowers of Lamiaceae (e.g. *Acinos arvensis* (Lam.) Dandy, *Ballota nigra* L., *Ballota pseudodictamnus* Bentham, *Salvia officinalis* L., *Stachys cretica* L., *Teucrium montanum* L. and *Thymus* spec.; Bellmann 1984, 1995, Schremmer 1959, Müller 1996). Although imagines have been recorded also from flowers of other plants families such as Boraginaceae, Crassulaceae and Geraniaceae (Schremmer 1959, Schmiedeknecht 1930, Blüthgen 1961), these visits were probably for nectar uptake only (Schremmer 1959).

Between flower visits the females often alighted briefly on the ground or on small stones close to the forage plants (Fig. 2). On a single occasion a female defecated after alighting on a stone. Similarly, females of *C. abbreviatus* from Central Europe were frequently observed to alight on sun-exposed stones or on the ground in the vicinity of forage plants (Blüthgen 1961). A comparable behaviour is shown by females of the Afrotropical *Celonites clypeatus* Brauns (Gess 1993).

Males repeatedly patrolled flowers of *S. thymbra* flying at the level of the inflorescences. Copulations were observed in two instances. The first was initiated by a patrolling male that rapidly approached a female flying towards a plant of *S. thymbra*. The female responded, in that she flew about 0.2 m back from the plant, followed by the male which finally pounced on her. The pair fell to the ground, where a short period of grappling occurred of about one second, after which the male was positioned on the back of the female with his middle and hindlegs wrapped around the female's metasoma and his genitalia inserted into the genital chamber of the female (Fig. 3). The pair remained motionless in this position for about 10 seconds. Then the partners separated and flew away. The second copulation differed from the first in that the patrolling male pounced on a female visiting a flower of *S. thymbra*. During the following insertion phase the pair remained on the flower. The male released the female's body and fell over backwards but his genitalia remained in the female's genital chamber. After less than 10 seconds, the pair separated and both partners flew off. The female alighted on a nearby stone and cleaned her head with her forelegs, while the male flew off and disappeared. This is the first record of mating behaviour in *C. abbreviatus* and also the first description of the copulation of a species of the genus *Celonites*, in general. However, it has been recorded that males of Afrotropical species of *Celonites* also search for females in the vicinity of forage plants (Gess 1996: 59) indicating that resource based mating systems may be more widespread in this monophylum. The unusual position of the male in the second copulation looked similar to the hanging position in the first phase of the copulation of vespine wasps (cf. Schulz-Langner 1954). However, it remains to be shown whether this is a regular alternative mating position in *C. abbreviatus* or if the male accidentally lost his hold on the female's metasoma.

Imagines of *C. abbreviatus* were not observed at water, which is in agreement with the behaviour of *C. abbreviatus* in Central Europe (cf. Bellmann 1984, 1995) and of Afrotropical species of *Celonites* (Gess 1996: 107).

ACKNOWLEDGMENTS

John Plant (Vienna) kindly read the manuscript and improved my English.

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